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Title:	IDENTIFINDER Overview and Operation
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National Nuclear Security Administration

OFFICE OF NONPROLIFERATION AND ARMS CONTROL (NPAC)

IDENTIFINDER
Overview and Operation

Fundamentals of Non-Destructive Assay for International Safeguards

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Terminal Learning Objective

- Explain the measurement applications of the HM-5 (IdentiFINDER)

- Demonstrate operation of the HM-5 IdentiFINDER

Enabling Learning Objectives

1. Describe the features and application of the HM-5
2. Describe the Finder Mode Feature
3. Describe the isotope identification feature
4. Describe the U/Pu verification feature
5. Describe the active length measurement feature
6. Describe the enrichment measurement feature
7. Familiarization with the operation of the HM-5

Enabling Learning Objectives

8. Locate sources using the Finder Mode
9. Identify sources
10. Perform verification measurements of U and/or Pu
11. Measure the active length of a fuel rod or assembly
12. Measure the enrichment of an uranium item
13. Quantify the limits of the measurement techniques by varying measurement conditions

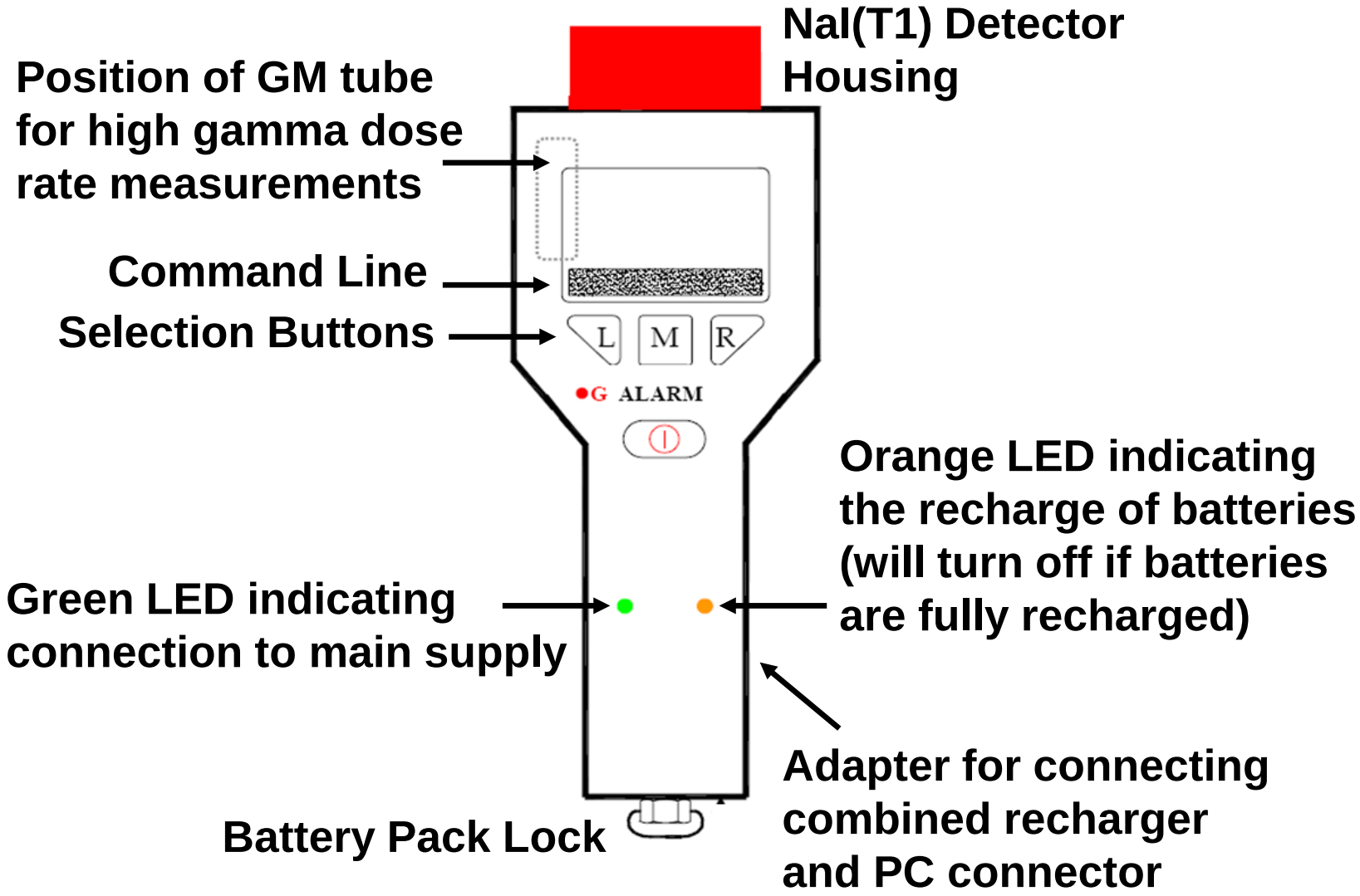
General Description

- Portable hand-held radionuclide detection and identification device
- Automatic calibration and continuous stabilization
- Digital signal processing
- Visible and audible alarms
- Nuclide ID based on template matching
- Saving and downloading spectra to the PC

Applications for Safeguards

- Nuclear material presence verification
- Nuclear material location and distribution
- Isotope identification
- Uranium enrichment measurement (with built-in NaIGEM software)

identiFINDER Layout

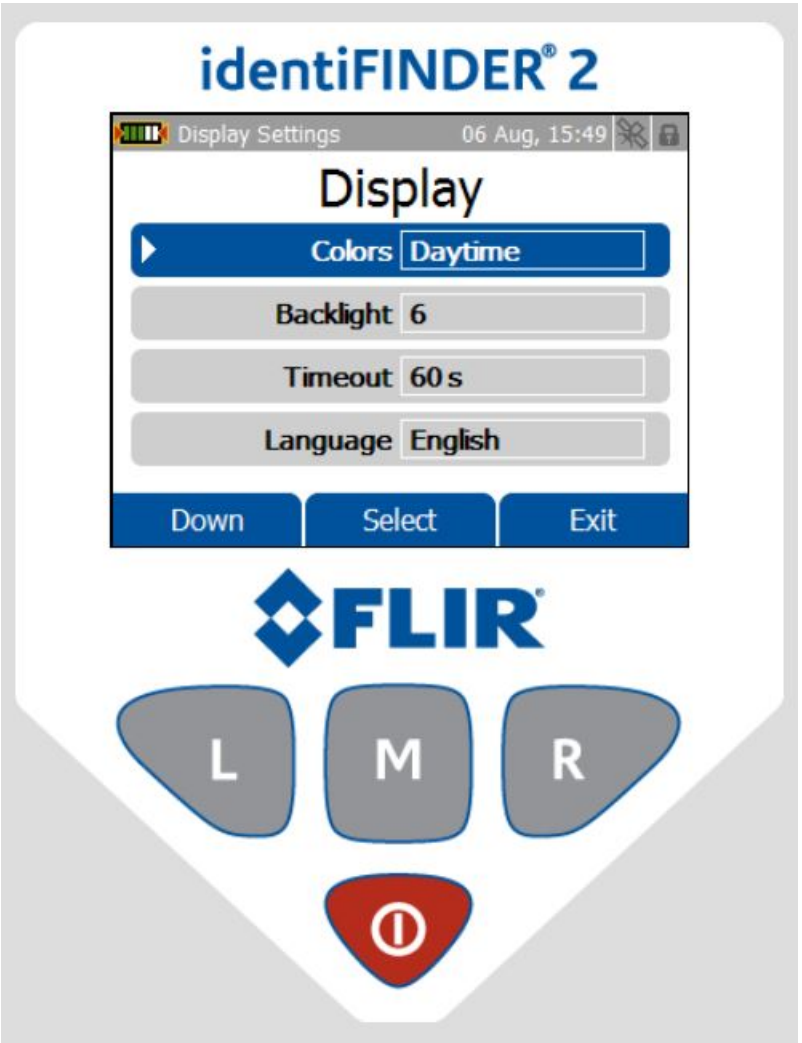


Instrument Assembly

Note: some models do not allow for removing the collimator cap.

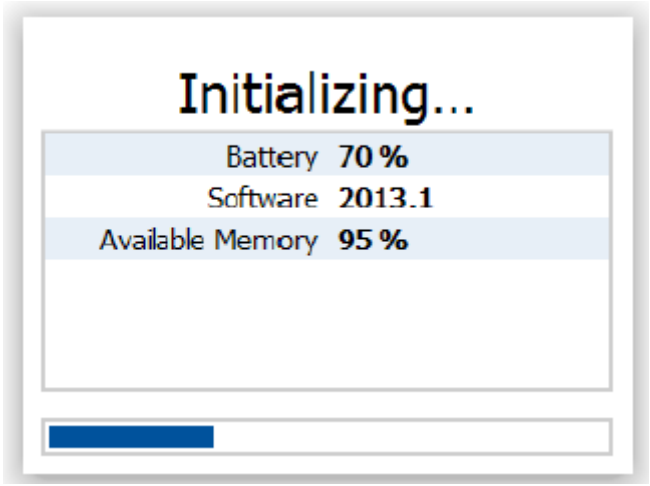
Buttons

- There are three multifunction keys displayed in the inverted menu line: left, middle, right
  - L key is often used to toggle through menu options
  - M key is used to select items
  - R key is often used to EXIT



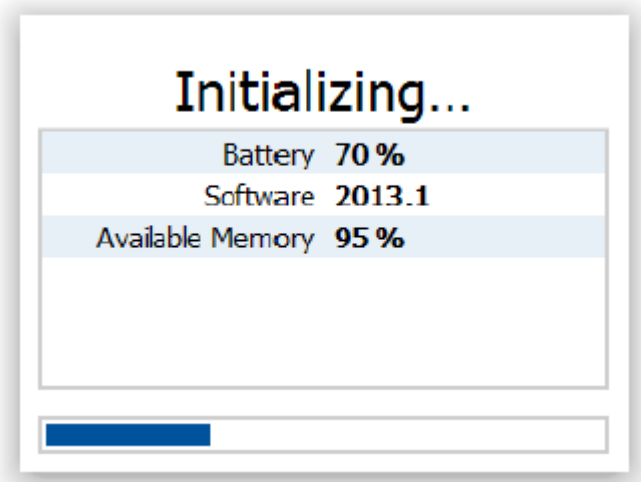
Starting identiFINDER

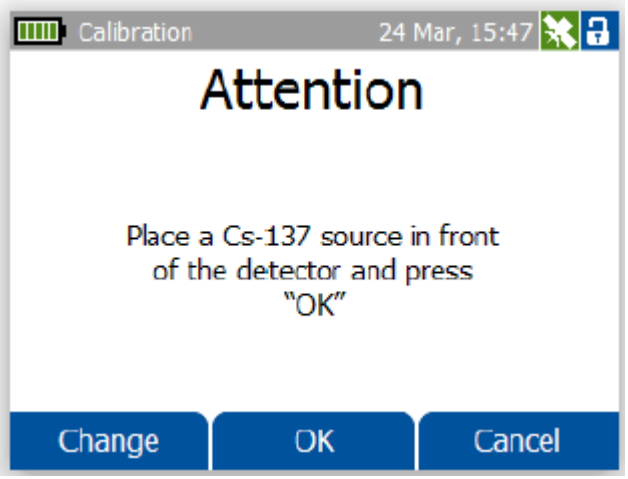
- Press ON/OFF button
  - the red ALARM lamp lights up
- During the boot sequence the display shows
  - Battery
  - Software version
  - Available memory
  - And performs the calibration



Calibration

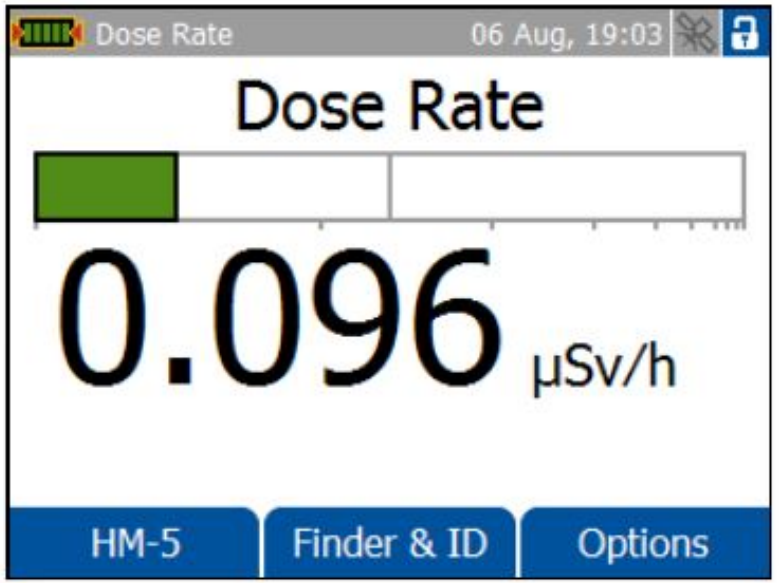
- During initialization the instrument measures the internal Cs-137 source for energy calibration
- If not interrupted calibration takes about 60 sec
- Calibration should be performed in low background area
- If there is no internal source the detector will ask for one





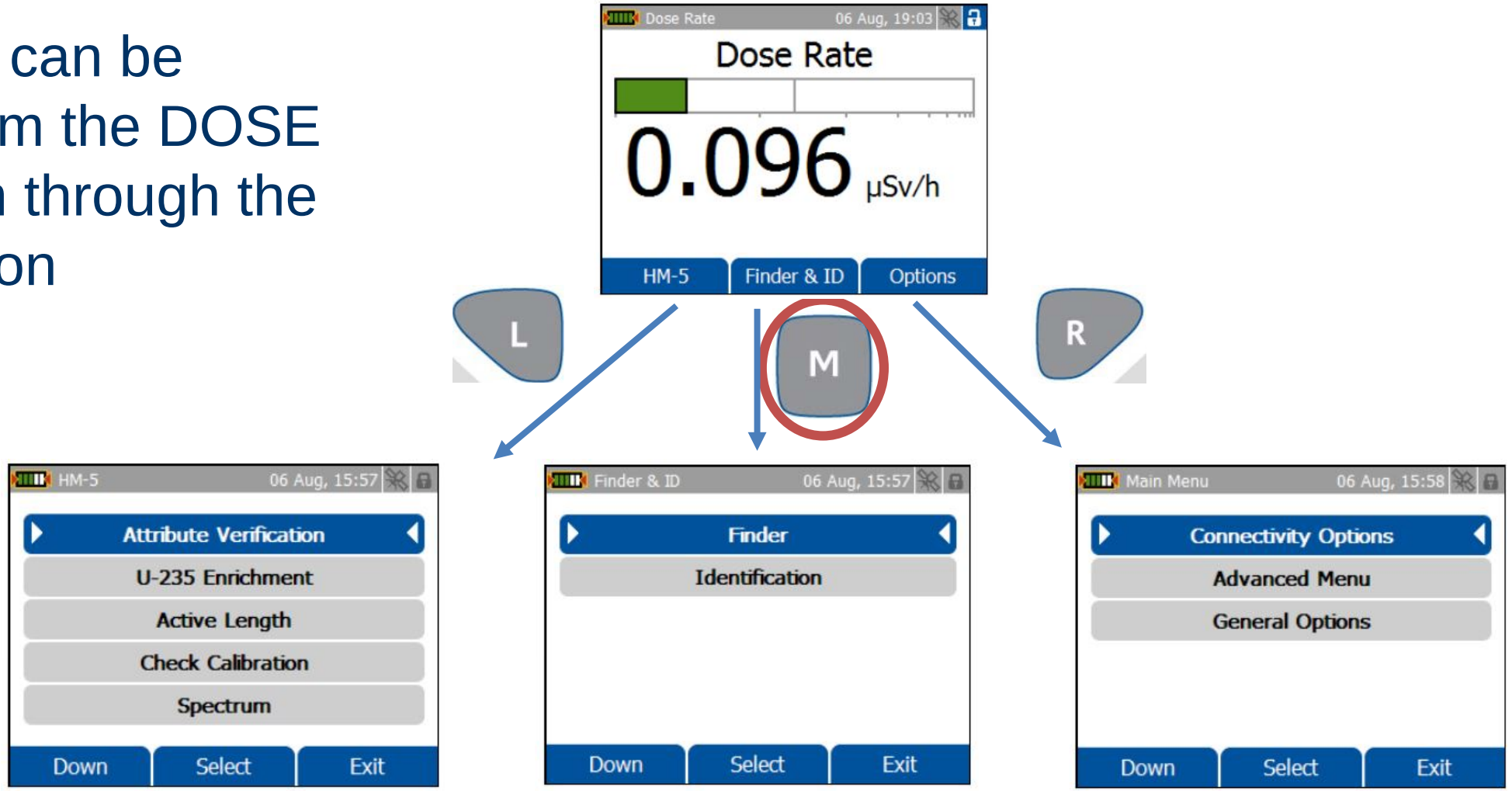
Dose Rate Mode

- Ambient dose rate equivalent
- Count rate per second
- At dose rates above 500 µSv instrument switches to GM-tube
- The unit can be changed to rem
  - Finder&ID > Finder > Dose Rate Settings > Dose rate settings



Finder Mode

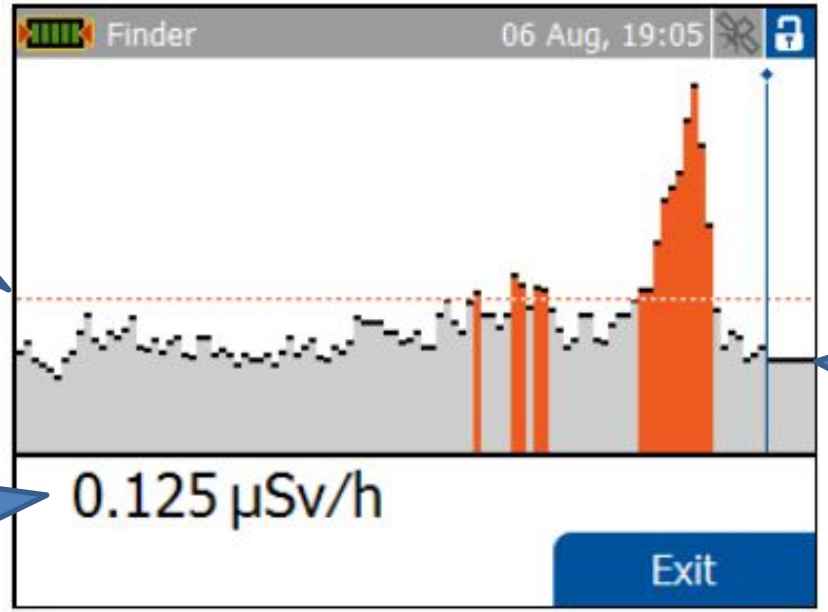
- Finder mode can be accessed from the DOSE RATE screen through the FINDER option



Finder Mode

Alarm threshold setting, 100% of the background

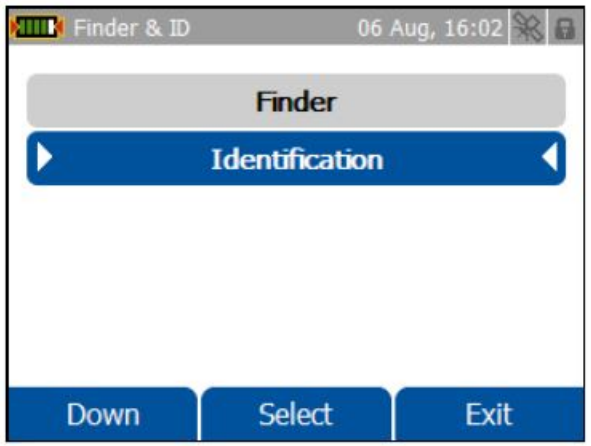
Dose rate reading

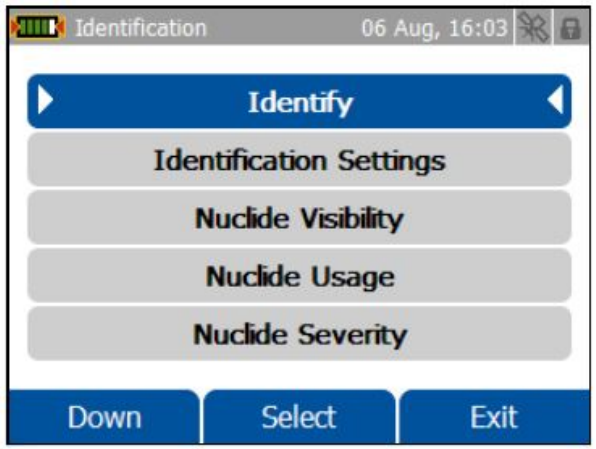


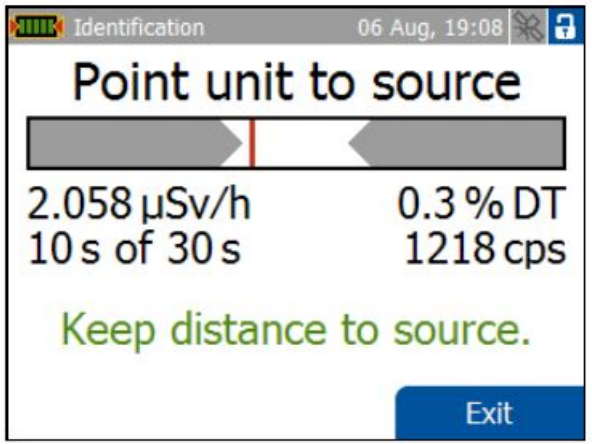
Vertical bar graph represents amount in dose rate

Identification Mode

- Use ‘L’ (Down) to Select ‘Identification’
- Use ‘M’ (Select) to initiate ‘Identification’



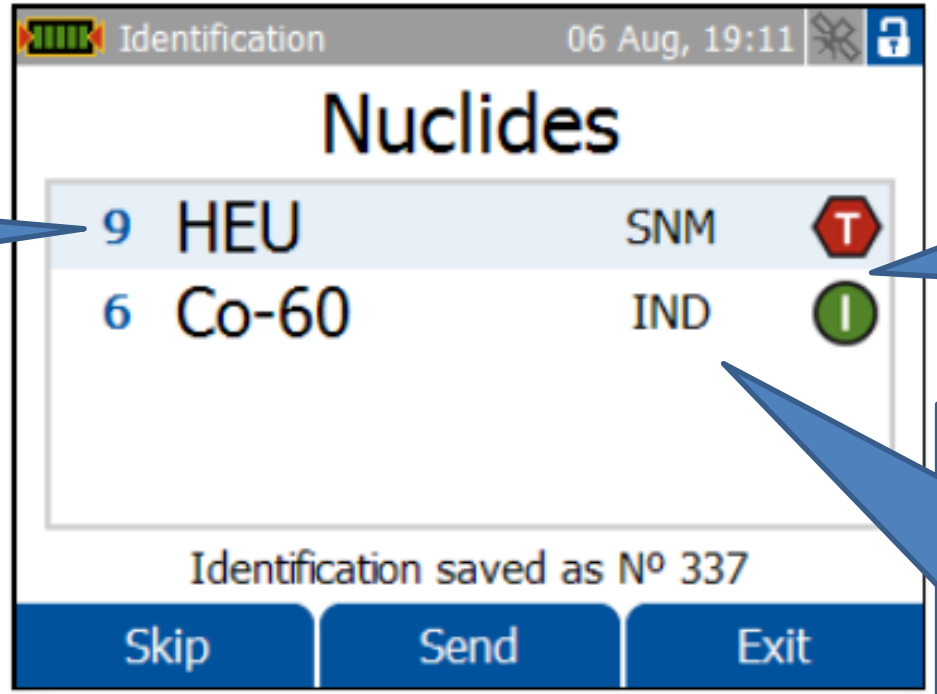




Toggles between Finder and Identification

Successful Nuclide Identification

Level of confidence on a scale from 1 to 10

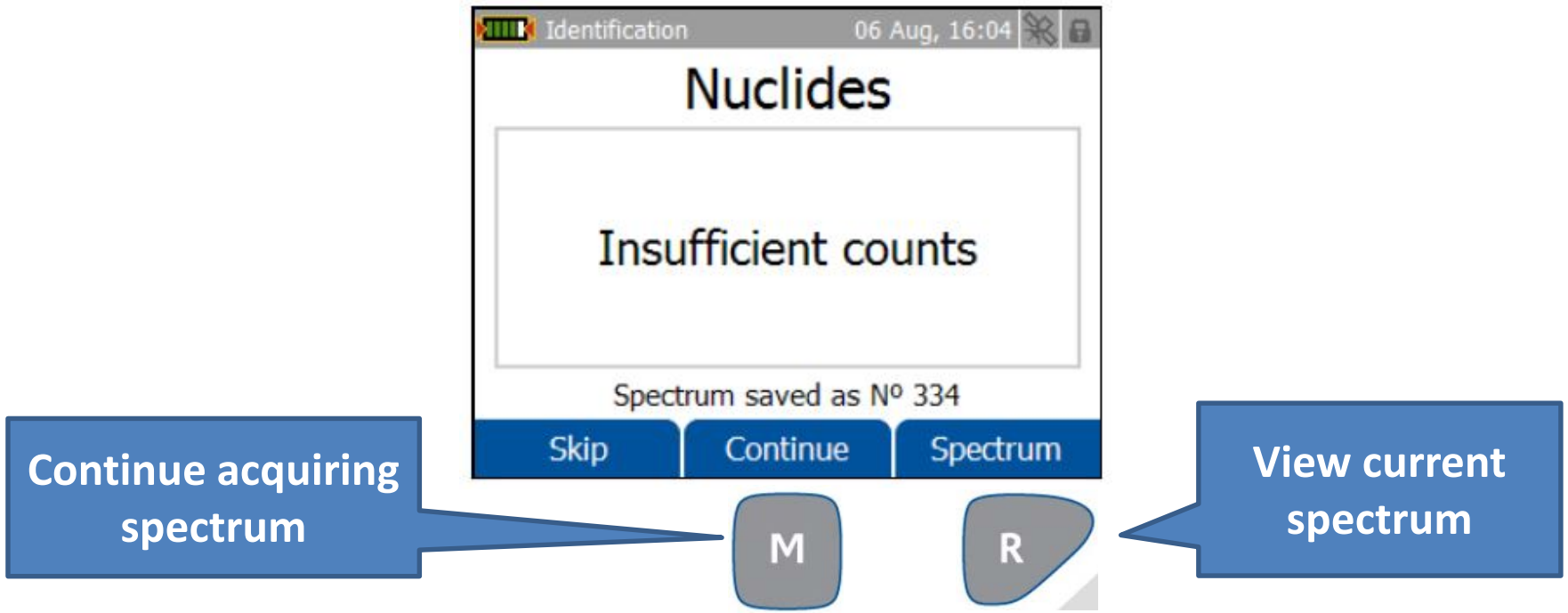


Severity:
Threatening
Suspicious
Innocent

Nuclide Category:
SNM – Special nuclear material
Nuc – Former name for SNM
Ind – Industrial
NORM – Naturally occurring Radioactive Material
Med – Medical

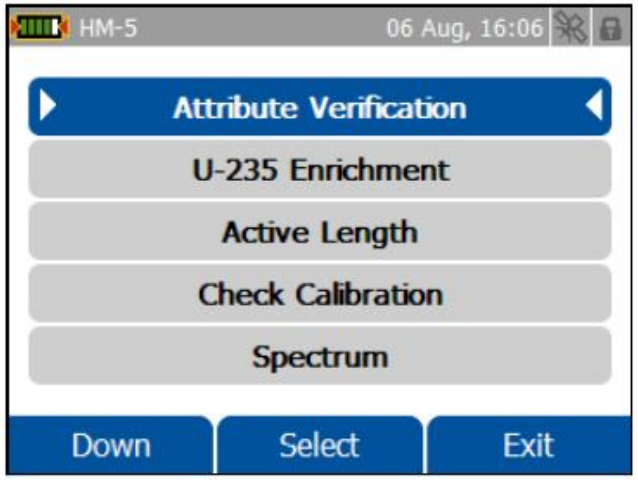
Activity Too Low

- If the instrument was not able to identify isotopes in the source then
  - Either continue counting another 30 s or
  - Exit and move closer to source



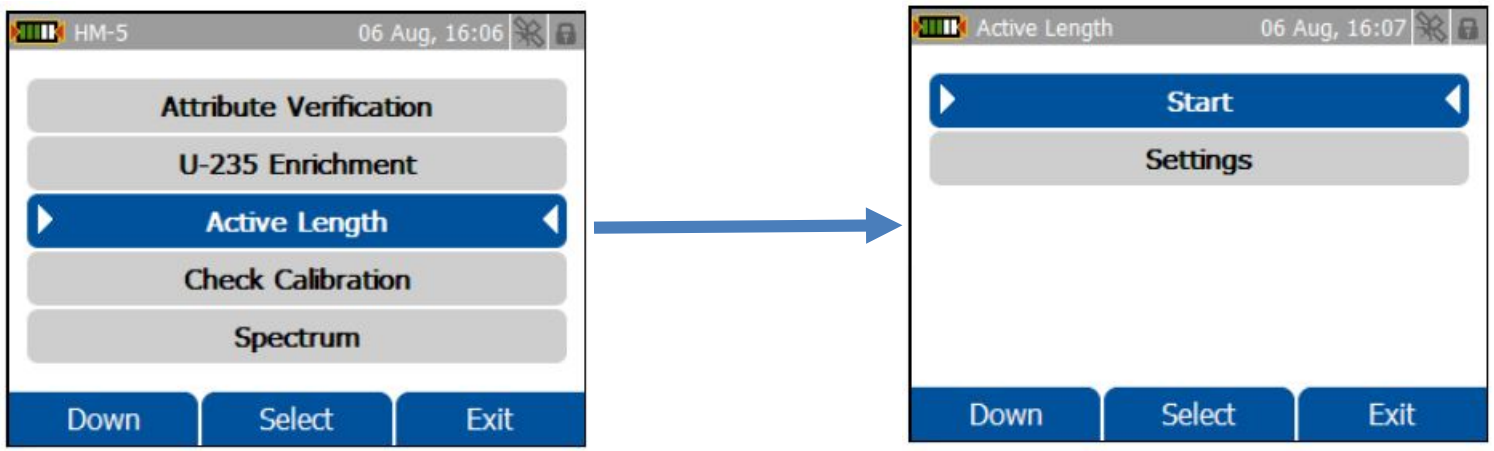
HM-5 Mode

- HM-5 mode includes specific nuclear safeguards applications:
  - Attribute verification – determine of presence of U, Pu or Th
  - Active length verification – verify material distribution in fuel and active length of fuel elements
  - U-235 enrichment – verify uranium enrichment using NaIGEM

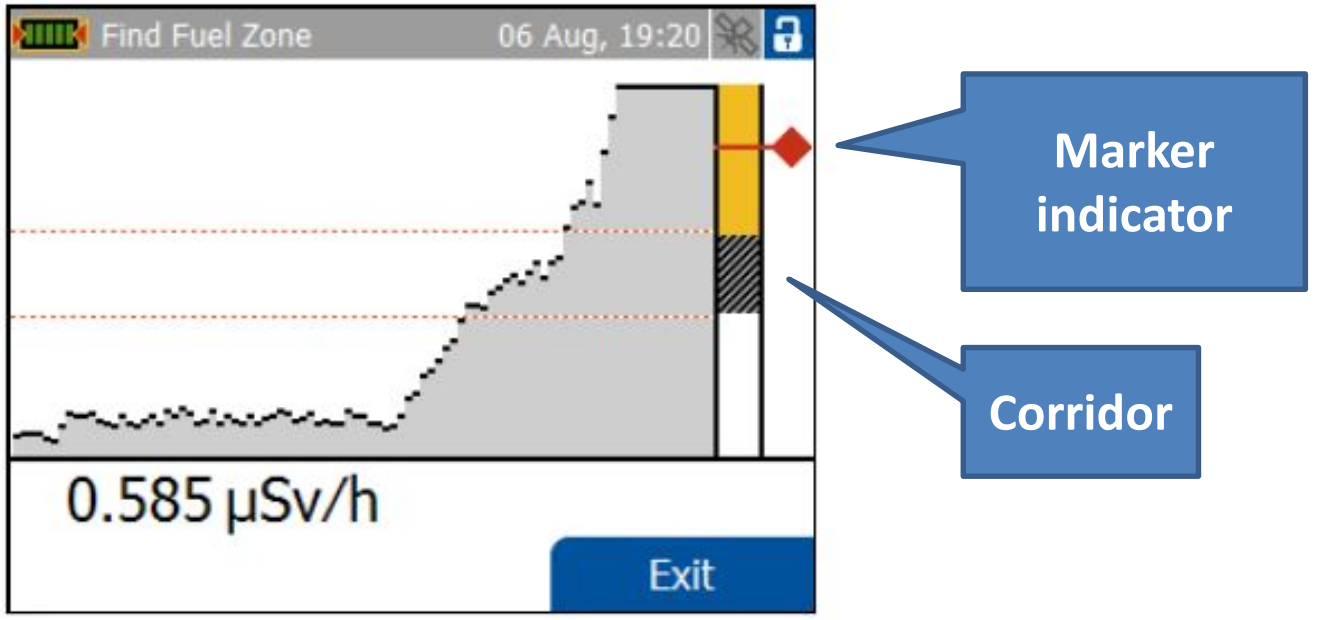


Active Length Verification

- Active length verification mode is used for verification of the presence of material in the fuel rod and its distribution



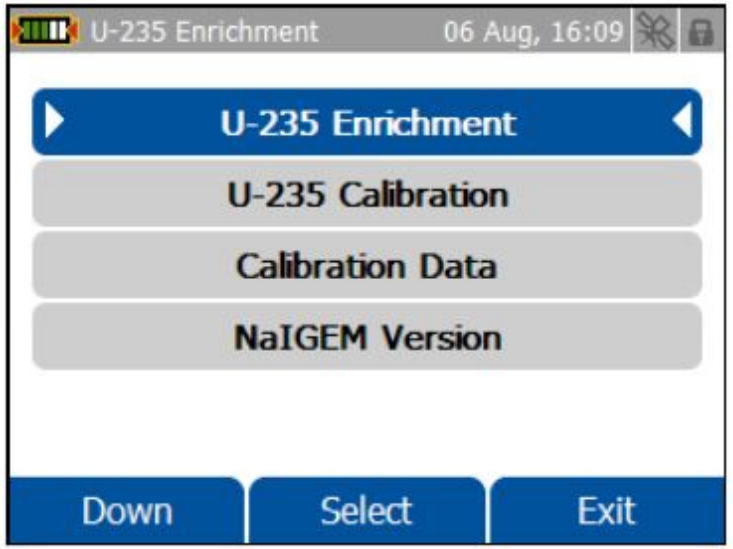
Active Length Measurements



- Take a spectrum of the fuel zone
- Spectrum outside the fuel zone
- Move slowly from the outside zone toward fuel zone
- The border of the fuel zone is reached when marker is in corridor

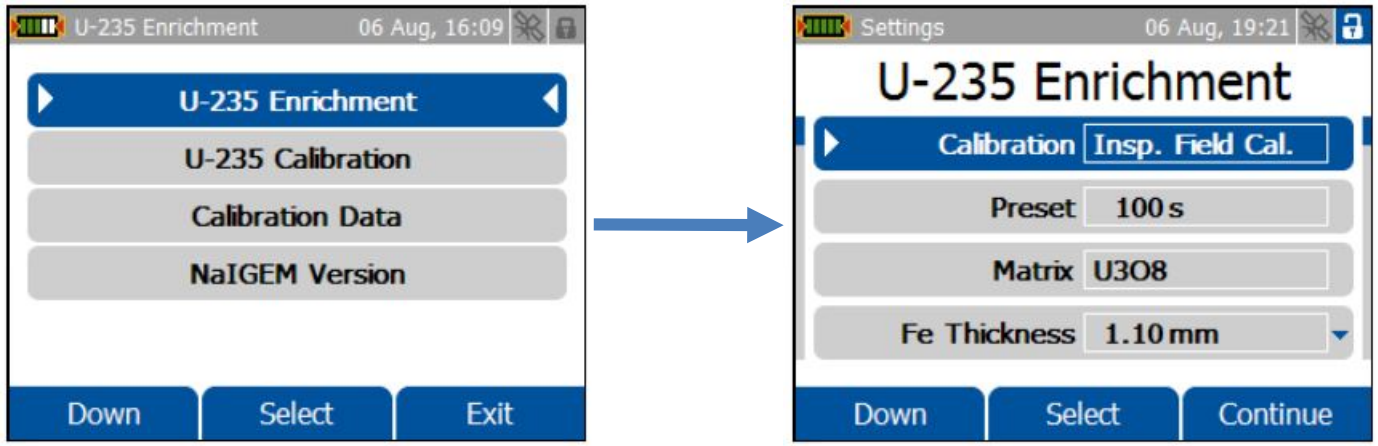
U-235 Enrichment Measurements

- identiFINDER uses special built-in version of NaIGEM software for U-235 enrichment measurements
- Usually Enrichment option in identiFINDER is used for confirmation enrichment measurements, for precise measurements a specialized system is recommended instead



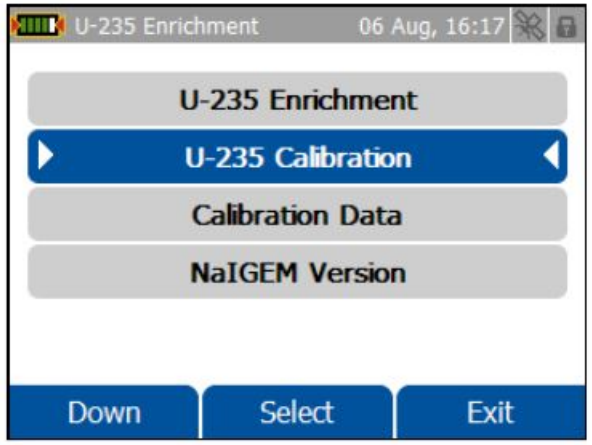
Measurement Parameters

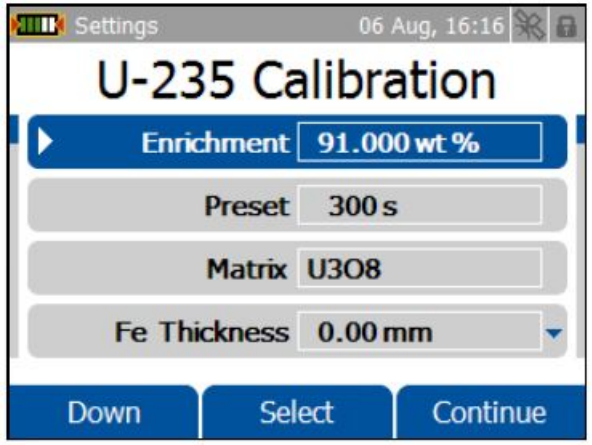
- In Measurement Parameters section user can adjust:
  - Counting time
  - Fe thickness and density
  - Al and Cd thickness
  - Material matrix (metal, U_3O_8, UO_2, etc.)

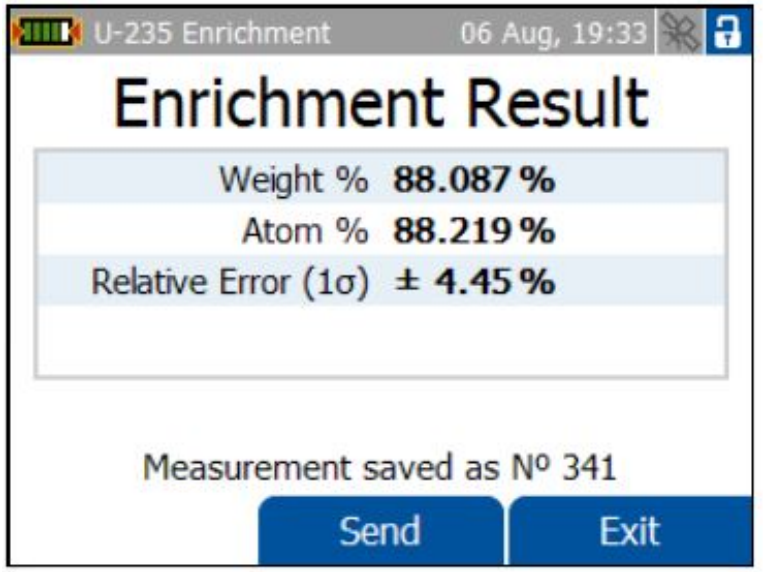


Calibration and Analysis

- U-235 enrichment analysis requires one-point calibration with the known source
- Analysis results are quoted in weight percent with relative and absolute errors quoted

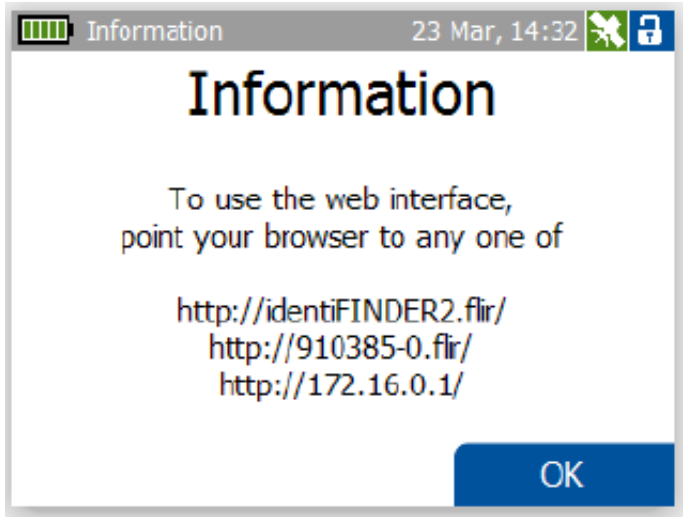


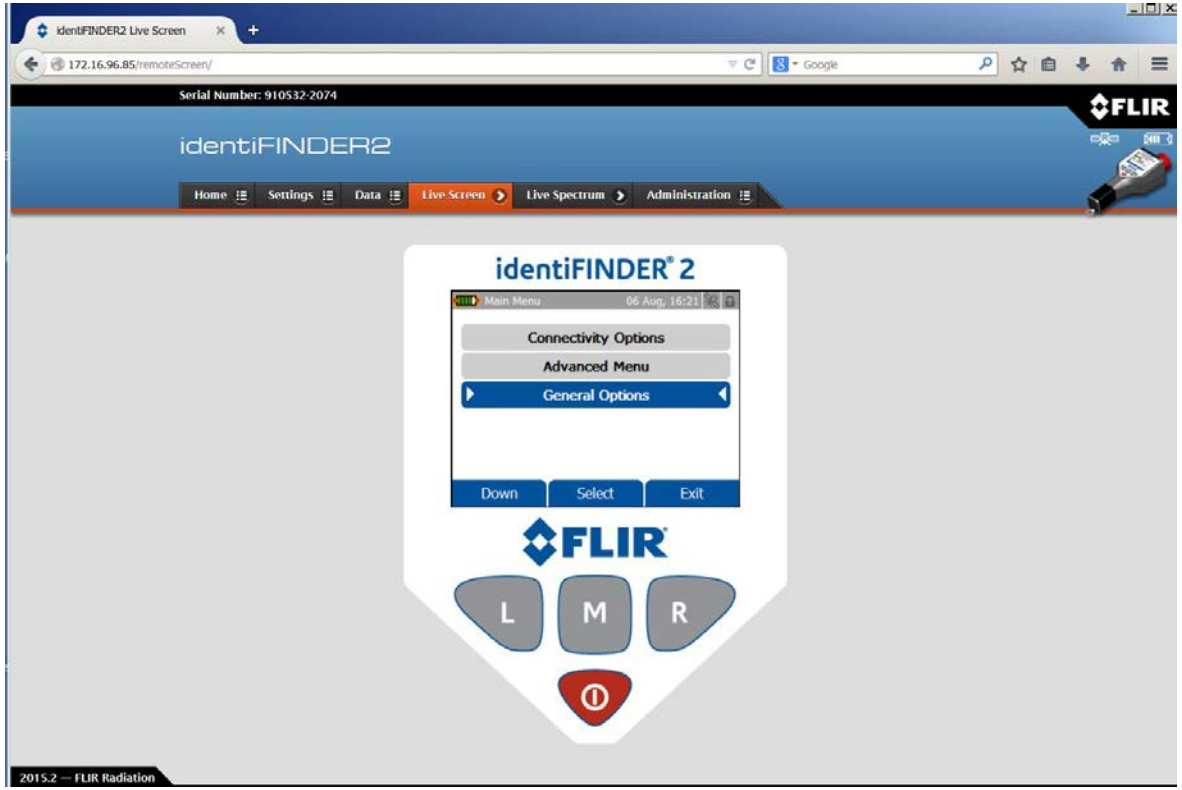




Connecting to a computer

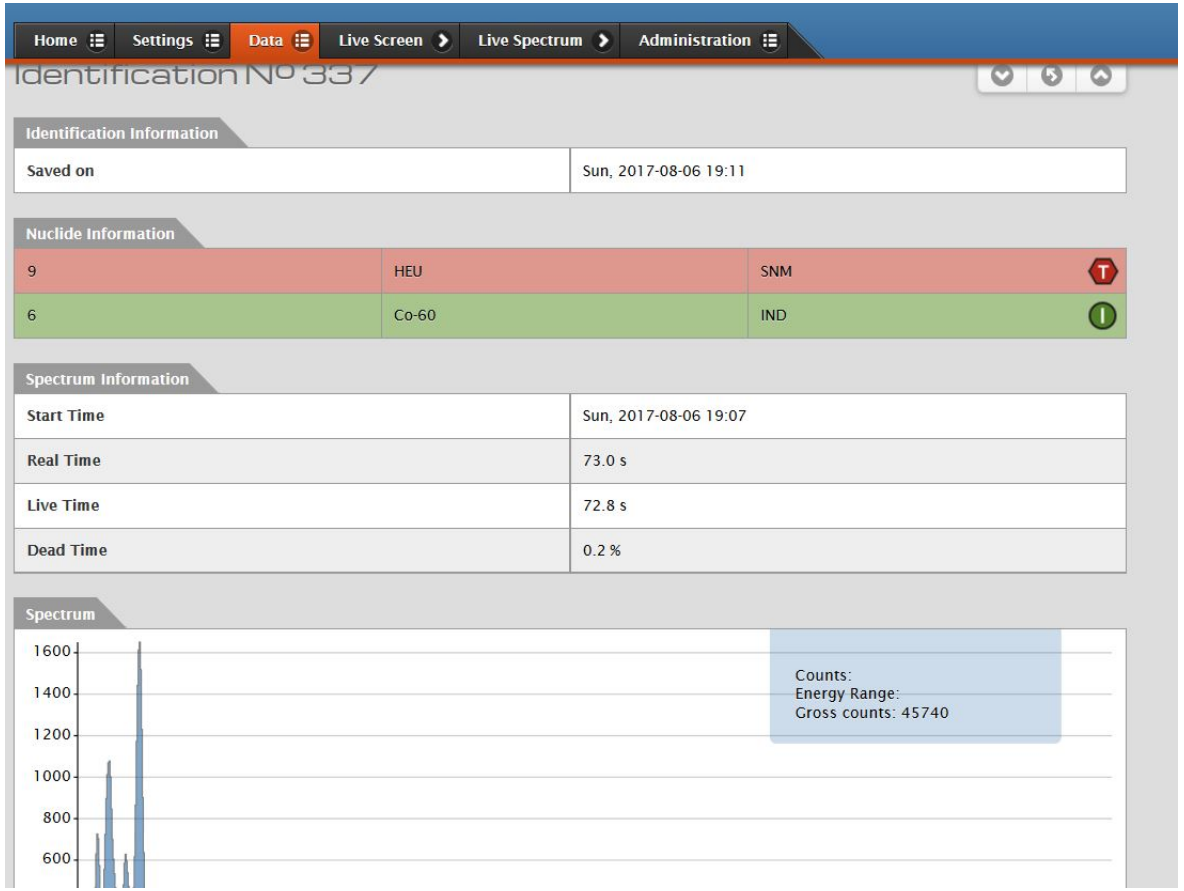
- Instructions will appear after connecting the device to a computer
- See the manual for more ways to transfer data





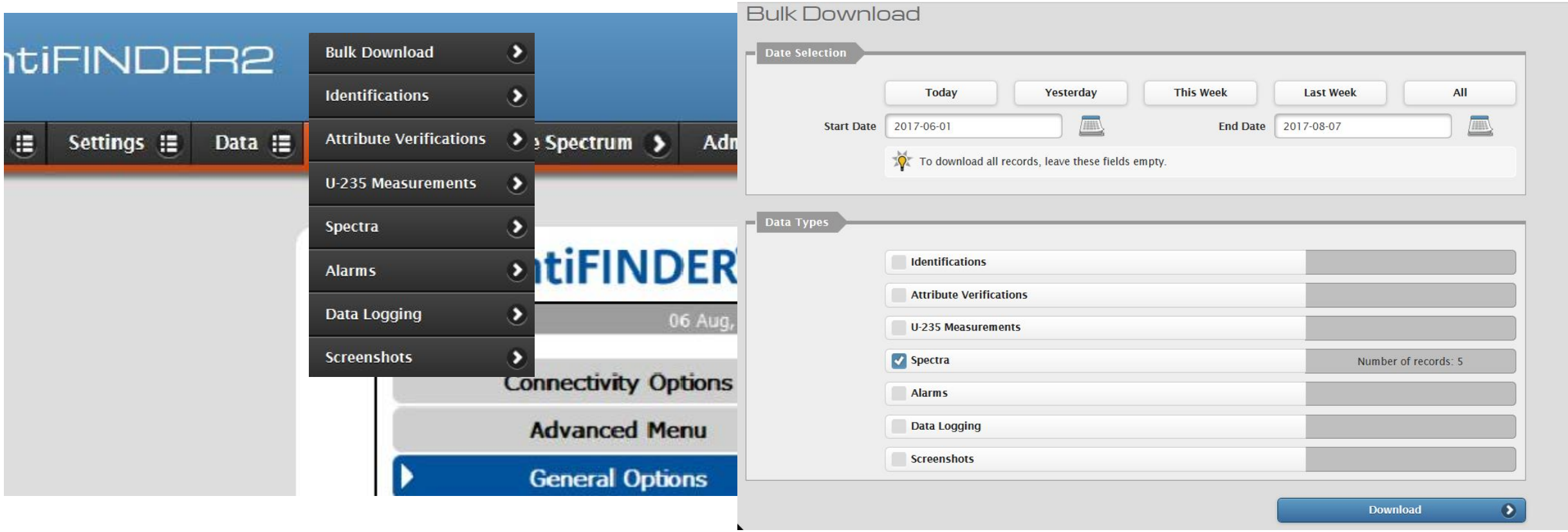
View individual measurement details

- Select Data > Identification > Select measurement



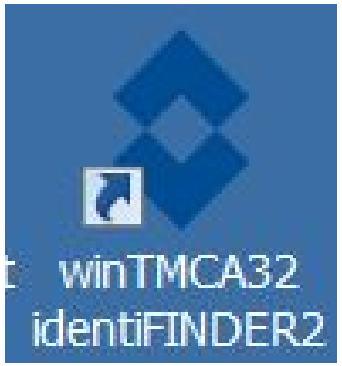
Bulk download of spectra

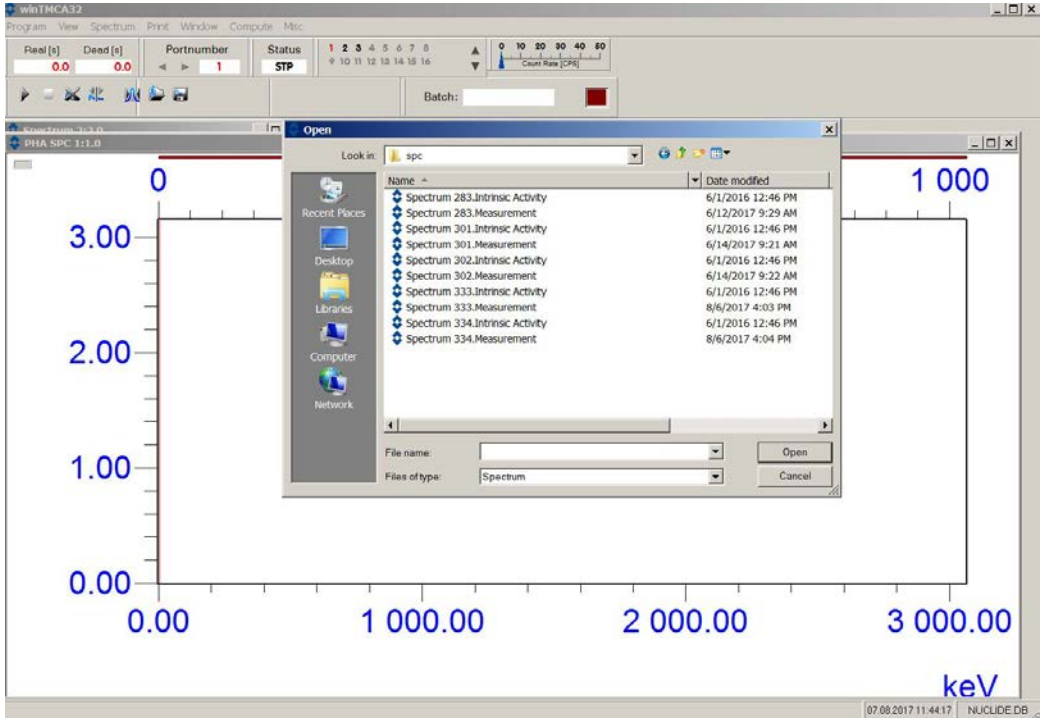
- Select Data > Bulk Download to save spectra to a computer for analysis



Analysis of spectra – winTMCA32

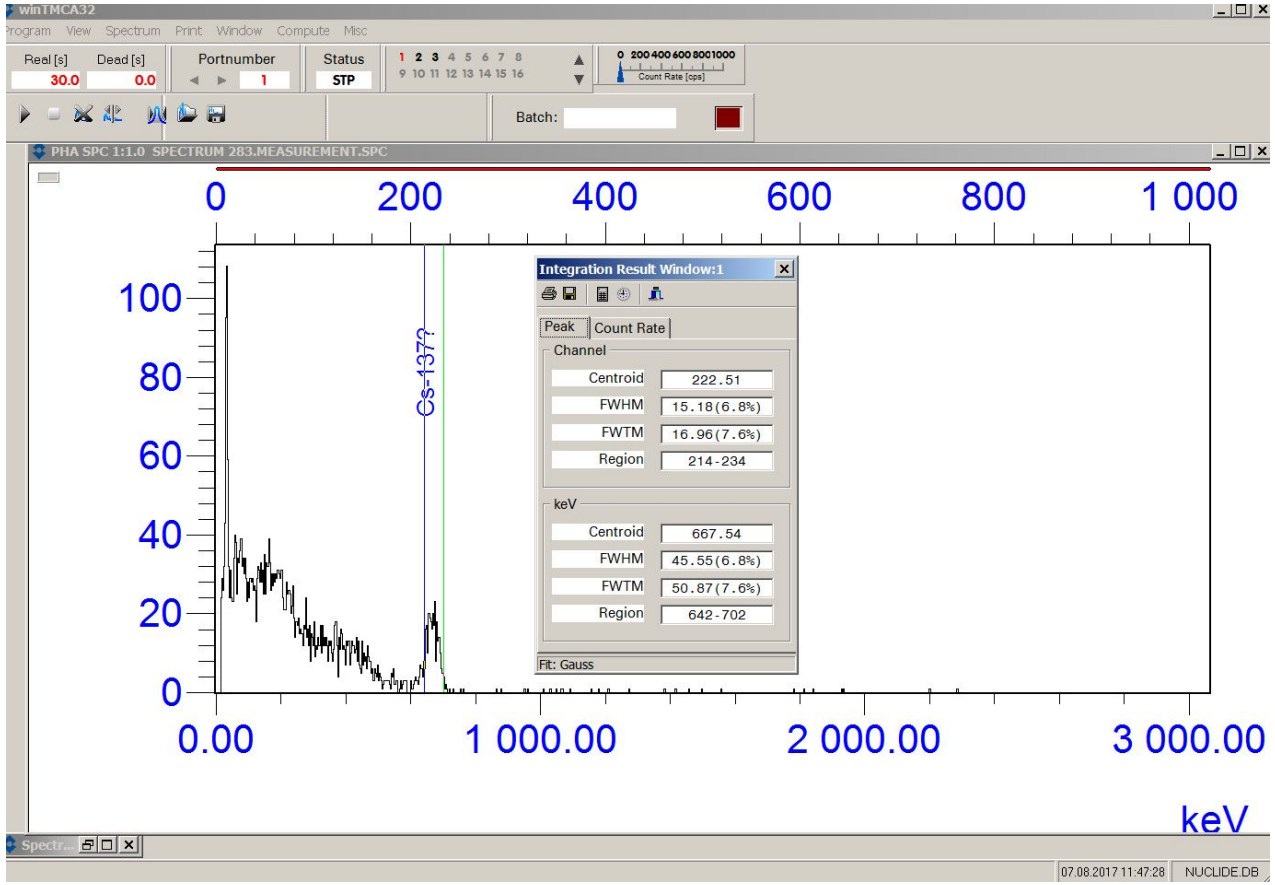
- Open winTMCA32 to analyze spectra on a computer
- Select Spectrum > Load to select a spectrum to view
- You must note the spectrum numbers of your measurement!





Viewing spectrum

- Right click to add ROI markers



Summary

- The identiFINDER is a portable hand-held radionuclide detection and identification device
- Key safeguards applications of the identiFINDER:
  - Verify the presence of nuclear material and determine its location and distribution
  - Identify isotope(s) present
  - Uranium enrichment measurement (with NaIGEM software)
- identiFINDER exercises will include:
  - Use Dose Rate mode to measure gamma dose rate
  - Use Finder mode to find various sources
  - Use Identification mode to identify those sources

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[Name of Course]
[Location and Date of Course]

[Name of Presenter]
[Professional Affiliation of Presenter]

[Release Organization and Number]

References

- identiFINDER R 400 user manual. FLIR Corporation. Mar 2014.